

Title Exploring the role of lipoxygenases on walnut quality and shelf-life  
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Abstract:

Compared to other nuts, which contain mostly monounsaturated fatty acids, walnuts accumulate mostly omega-6 and omega-3 polyunsaturated fatty acids which are essential dietary fatty acids. This feature, together with the presence of other beneficial components of kernel (vitamins, phytosterols, polyphenols, etc.) can explain the positive role displayed by walnuts in the prevention of coronary heart disease. However, it is well known that high levels of polyunsaturated fatty acids have negative impact on the quality and shelf-life of kernel and related products. The developing of off-flavours during nut storage is considered a main concern since it reduces nut consumption and has consequently a negative impact on the whole food-chain.

Lipoxygenases (LOXs) catalyse the hydroperoxidation of polyunsaturated fatty acids, such as linoleic and linolenic acids which are abundantly accumulated in walnut kernels, with consequent production of 9- or 13-hydroperoxides. These molecules are very unstable and are rapidly converted to an array of other compounds, known as oxylipins, by the action of the other enzymes downstream located in the LOX pathway. Among these, hydroperoxide lyases (HPLs) catalyse the cleavage of hydroperoxides into short-chain aldehydes and oxo-acids. These volatile aldehydes are important constituents of the flavour and aroma of many fruits and vegetables. However, not all C<sub>6</sub> aldehydes are perceived as pleasant. In the case of soybean and other legumes n-hexanal (one of the C<sub>6</sub> aldehydes produced by HPL catalysis) is the principle responsible of the unpleasant "grassy beany" flavour. Therefore, these enzymes can influence positively or negatively food quality. Here we report about the biochemical characterisation of LOX and HPL from mature and one year aged walnut kernel. LOX and HPL activities were also assayed in these samples. Moreover, we monitored the presence of either hydroperoxides and volatile aldehydes in lipid bodies purified from mature and aged nuts. From our results, we conclude that the presence of either LOX activity and hydroperoxides in purified lipid bodies can indicate a role of this enzyme in nut quality.